MISCELLANEOUS PHENOMENA.

DROUGHT.

The following reports of damaging drought have been made by regular and voluntary observers of the Signal Service:

Savannah, Ga., 31st: the weather during the month has been unusually dry, and it is the first month since the establishment of the Signal Service station in this city, in 1871, that the rainfall has amounted to less than 0.01 inch. The total precipitation for the month, 0.10, has been obtained from dew and fog. Augusta, Ga.: the drought which has prevailed in this section since November 27th was broken by rain on the afternoon of December 30th. The high temperature combined with the long prevailing dry weather makes the month the most remarkable December on record.

Raleigh, N. C., 31st: the month of December has been unusually warm and dry.

Jupiter, Fla., 31st: the dry weather during the month has been disastrous in this part of the state. Growers report that about one-half of the early vegetables have been injured by the drought. Matanzas, Fla., 31st: a severe drought prevails in this section.

Meridian, Miss.: the drought which has prevailed since the 27th of November was ended by the rain which fell during the afternoon of the 29th.

Emilie (near Mount Airy), La., 31st: the drought, though somewhat broken by the light rain in November, still continues, and its effect is very much felt. The swamps have never been so dry as they are at the present time.

Oskaloosa, Iowa, 31st: owing to insufficient rainfall the wells are very low and the creeks are nearly all dry.

FOREST FIRES.

Chattanooga, Tenn.: a dense smoke prevailed from 10 a. m. to 5.40 p. m., 13th, caused by forest fires in the mountains.

Emilie, La., 31st: the fires which began in the woodlands toward the end of November are still burning in some places and have caused considerable damage to timber.

PRAIRIE FIRES.

Fort Sill, Ind. T.: 1st, 12th, 15th to 19th, 21st, 25th, 26th, 28th to 31st. Fort Reno, Ind T.: 11th, 12th, 16th, 28th.

HALOS.

Solar halos were most frequently reported in Michigan, where they were noted on eleven days; in Illinois and Ohio on nine days; on from six to eight days, inclusive, in California, Kansas, New York, North Carolina, Virginia, and Wisconsin, and on from one to five days, inclusive, in Arkansas, Connecticut, Georgia, Idaho, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, North Dakota, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, and Washington. In states and territories other than those named no solar halos were reported. They were reported in the greatest number of states and territories, twelve, on the 16th; in from six to nine, inclusive, on the 1st, 5th, 9th, 10th, 15th, 25th, 27th to 31st, and in from one to five, inclusive, on the 2d, 3d, 4th, 6th, 7th, 8th, 11th to 14th, 17th to 21st, 23d, 24th, 26th. No solar halos were reported on the 22d.

Lunar halos were most frequently reported in Michigan, where they were noted on eighteen dates; in Illinois on sixteen dates; on from eleven to fifteen dates, inclusive, in Kansas, Louisiana, Missouri, New York, Ohio, Pennsylvania, South Dakota, and Texas, and on from one to ten dates, inclusive, in Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Indiana, Indian Territory, Iowa, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Oregon, South Carolina, Tennessee, Utah, Vermont, Virginia, Washington, Wisconsin, and Wyoming. Rhode Island and West Virginia were the only states in which no lunar halos were reported. They were reported in the greatest number of states and territories, twenty-three, on the 29th; in twenty-one on the 28th; in from fifteen to twenty, inclusive, on the 1st to 4th, 9th, 27th, 30th, 31st; in twelve on the 5th and 6th; in eleven on the 7th and 8th, and in from one to ten, inclusive, on the 10th to 19th, 21st to 26th. No lunar halos were reported on the 20th.

METEORS.

The distribution of meteors, by dates, was as follows: 1st, State College, Ohio; Philipsburgh, Pa. 3d, Eagle's Mere, Pa. 5th, Point Isabel, Ind. 6th, Barren Creek Springs, Md.; Rimersburgh, Pa. 7th, Woodbury, N. J. 10th, Topeka, Kans. 11th, Villa City, Fla.; Topeka, Kans.; Hilton, Lacon, and Pekin, Ill.; Vevay, Ind.; Cedar Rapids, Iowa; Cumberland, Md.; Albion, Mich.; Oregon, Mo.; Beverly and Egg Harbor City, N. J.; Riddleton, Tenn. 12th, Lead Hill, Ark.; Golconda, Ill.; Manson, Iowa; La Harpe, Kans.; Beverly and Egg Harbor City, N. J.; Washington, N. C.; Dyberry, Philipsburgh, and State College, Pa.; Fort Sully, S. Dak.; Dale Enterprise, Va. 13th, Beverly, N. J.; Spearfish, S. Dak.; Dale Enterprise, Va. 14th, Dale Enterprise, Va. 15th, Beverly, N. J.; Washington, N. C.; Yellow Springs, Ohio. 18th, Villa City, Fla.; Albion, Mich. 19th, Canton and Hartford, Conn.; Mount St. Mary's, Md.; Nineveh and Wedgwood, N. Y.; Raleigh, N. C.; Blue Knob and Eagle's Mere, Pa. 20th, Villa City, Fla.; La Harpe, Kans.; Nottaway C. H., Va. 21st, La Harpe and Wichita, Kans.; Honey Mead Brook, N. Y.; Quakertown, Pa.; Fort Sully, S. Dak.; Grantsburgh, Wis. 22d, Rushville, Ill.; Spartanburgh, S. C. 23d, Kootenai, Idaho; Spartanburgh, S. C.; Wauseon, Ohio. 24th, Hilton, Ill.; Spearfish, S. Dak. 25th, Villa City, Fla.; Westerville, Ohio. 26th, Randolph, Mass.; Spearfish, S. Dak. 27th, Villa City, Fla.; Washington, N. C. 28th, Charlesville, Pa. 29th, El Paso, Tex. 30th, Kansas City, Kans.

SUN SPOTS.

Haverford College Observatory, Pa. (observed by Prof. F. P. Leavenworth):

Date.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.	Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	
Dec., 1889.										
1, 12 m.....	0	0	0	0	0	0	0	0	7	Definition good.
2, 10 a. m....	0	0	0	0	0	0	0	0	0	Definition poor.
4, 11 a. m ...	0	0	0	0	0	0	0	0	0	Definition poor.
12, 3 p. m ...	1	1	0	0	0	0	1	1	....	Definition good.
13, 11 a. m ...	0	0	1	1	0	0	0	0	....	Definition good.
16, 9 a. m ...	0	0	0	0	0	0	0	0	1	Definition poor.
19, 9 a. m ...	2	9	0	0	0	0	2	9	1	Definition poor, spots small.
21, 10 a. m ...	1	28	0	0	0	0	3	37	4	Definition good, spots small.
23, 12 m.....	0	0	0	0	0	0	1	1	4	Definition good.
24, 12 m.....	0	5	0	0	0	0	1	6	1	Definition fair.
25, 11 a. m ...	0	14	0	0	0	0	1	20	0	Definition fair, 1 large spot.
26, 11 a. m ...	0	0	0	0	1	1	1	13	0	Definition poor.
27, 11 a. m ...	1	10	0	0	0	0	2	23	....	Definition good, 2 large spots.
28, 11 a. m ...	0	0	0	0	0	0	2	21	....	Definition good, 1 spot has white mark in umbra.
31, 11 a. m ...	0	0	0	0	0	0	1	1	....	Definition poor, 1 spot has white mark in umbra.

Mr. C. E. Buzzell, Leaf River, Ill.: Solar observations were made only on the following days in December, 1889: 1st, 6th, 8th, 9th, 11th, 12th, 14th, 15th, 18th, 19th, 20th, 22d, 25th, 26th, 27th, 30th, and 31st. No spots were observed until the 18th, small group; near meridian in view on the 20th. 22d, prominent faculæ on both limbs. No spots on the 23d. One small spot, five days, which on the 25th increased to a group of fifteen spots, still in view on the 27th. On the 27th a large spot observed near the east limb, which was central on January 2d, 1890. All of the above were new disturbances.

Mr. John W. James, Riley, Ill.: no sun spots were seen till the 25th, then a group about 43,000 miles long, a little west of the sun's meridian, disappearing by solar rotation on the eve of the 30th. A single spot about 16,000 miles diameter found three days east of the sun's meridian on the 30th.

Mr. M. A. Veeder, Lyons, N. Y.: on December 12th a spot of considerable size was at the western limb, and some faculæ were near the eastern limb. 20th, a train of spots had formed nearly in the location of the faculæ that appeared by rotation on December 12th. These spots faded out and the faculæ in their location disappeared by rotation on the 24th. On the 20th a spot of considerable size was seen near the eastern limb; this spot had nearly faded out on December 22d, but on the 23d it increased again and was seen on the 25th, 26th, and 27th, followed by a train of smaller spots, which faded out before reaching the western limb. 26th, a large spot appeared by rotation and was seen on the 27th, 29th, and 31st. Observation was poor on many days in this month.

Mr. H. D. Gowey, North Lewisburgh, Ohio: sun spots 12th, 19th, 20th, 21st, 25th to 28th, 30th, and 31st.

MIRAGE.

Mirage were observed as follows: 1st, 4th, and 5th, Marquette, Nebr. 6th, Hampton, Iowa, and New England City, N. Dak. 11th, Bancroft, Iowa. 12th, Marquette, Nebr. 13th, Hampton, Iowa. 14th, Marquette, Nebr.; Woonsocket and Webster, S. Dak. 15th, Woonsocket and Webster, S. Dak. 16th and 17th, Hampton, Iowa, and Woonsocket, S. Dak. 22d, Webster, S. Dak. 26th, Marquette, Nebr.; Woonsocket and Webster, S. Dak. 27th, Marquette, Nebr., and Wolsey, S. Dak.

Spearfish, S. Dak.: a fine mirage was observed on the morning of the 8th. The high lands along the Belle Fourche were lifted into plain view, and, though twenty miles away, seemed but a mile or two distant. It lasted for more than an hour, beginning with the first rays of the morning sun.

Huron, S. Dak.: a singular, fine mirage was observed soon after daylight on the 22d, and lasted for about one hour. A range of hills covered with snow was seen at a distance of four miles east of this place. The projecting white mountain peaks, with intervening white spaces, composed of lakes, covered with ice, were plainly seen.

VERIFICATIONS.

FORECASTS FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for December, 1889, were made by Captain James Allen, 3d Cavalry, Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps.

Percentages of forecasts verified, December, 1889.

States.		States.	
Maine	79.2	Kentucky	87.0
New Hampshire	83.6	Ohio	84.1
Vermont	81.7	West Virginia	80.9
Massachusetts	82.9	Indiana	84.3
Rhode Island	85.3	Illinois	83.6
Connecticut	84.3	Lower Michigan	82.9
Eastern New York	85.2	Upper Michigan	77.4
Western New York	77.7	Wisconsin	83.5
Eastern Pennsylvania	84.1	Minnesota	80.1
Western Pennsylvania	80.5	Iowa	83.4
New Jersey	88.2	Kansas	82.3
Delaware	87.7	Nebraska	78.2
Maryland	86.5	Missouri	83.5
District of Columbia	85.0	Colorado	79.7
Virginia	84.5	North Dakota	83.7
North Carolina	87.4	South Dakota	80.8
South Carolina	86.8	Southern California*	85.9
Georgia	88.7	Northern California*	90.6
Eastern Florida	93.6	Oregon*	81.8
Western Florida	95.4	Washington*	80.7
Alabama	91.1	*By elements:* Weather	85.8
Mississippi	92.3	Temperature†	83.0
Louisiana	91.2		
Texas	89.0	Monthly percentage of weather and temperature combined‡	84.7
Arkansas	85.1		
Tennessee	83.2		

*In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. †The forecasts of temperature in districts east of the Rocky Mountains for December, 1889, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 AND 72 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for forty-eight and seventy-two hours, covering the second and third days in advance. Such forecasts are optional with the predicting officer, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 158; temperature, 92. Percentages of verifications: weather, 74.5; temperature, 84.9. Weather and temperature combined, 78.7.

Percentages of verifications of forecasts made for third day in advance. Number of predictions made: weather, 34; temperature, 7. Percentages of verifications: weather, 79.4; temperature, 78.6; weather and temperature combined, 79.0.

CAUTIONARY SIGNALS FOR DECEMBER, 1889.

Statement showing percentages of justifications of wind signals for the month of December, 1889:

Wind signals.—(Ordered by Captain James Allen.) Total number of signals ordered, seventy-one; justified as to velocity, wholly, fifty, partly, five; justified as to direction, sixty-two. Of the signals ordered, forty-nine were cautionary, of which thirty-five were wholly, and one partly, justified; and twenty-two were storm signals, of which fifteen were wholly, and four partly, justified. Thirty signals were ordered for easterly winds, of which twenty-two were justified, and forty-one were ordered for westerly winds, of which forty were justified. Percentage of justifications, 68.6.

Cold-wave signals.—(Ordered by Assistant Professor T. Russell.) Total number of signals ordered, two hundred and twenty-one; justified, one hundred and eighteen. Percentage of justifications, 53.4.

Percentages of local verifications of weather and temperature signals reported by directors of the various State Weather Services for December, 1889.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	72.1	80.4	New Jersey	80.1	92.2
Indiana	82.0	83.0	New York	82.6	86.3
Kansas	82.2	83.9	Ohio	88.0	82.0
Michigan	86.9	86.7	Pennsylvania	80.0	87.0
Minnesota	71.0	77.0	South Carolina	91.0	92.0
Missouri	76.0	79.0	Tennessee	82.7	78.9
Nebraska	82.7	88.1			

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts and summaries are republished from reports for December, 1889, of the directors of the various state weather services: